ABSTRACT OF THE DISCLOSURE

[0063] The invention includes methods of processing an initial di-carbonyl compound by conversion to a cyclic compound. The cyclic compound is reacted with an alkylating agent to form a derivative having an alkylated ring nitrogen. The invention encompasses a method of producing an N-alkyl product. Ammonia content of a solution is adjusted to produce a ratio of ammonia to di-carboxylate compound of from about 1:1 to about 1.5:1. An alkylating agent is added and the initial compound is alkylated and cyclized. The invention includes methods of making N-methyl pyrrolidinone (NMP). Aqueous ammonia and succinate is introduced into a vessel and ammonia is adjusted to provide a ratio of ammonia to succinate of less than 2:1. A methylating agent is reacted with succinate at a temperature of from greater than 100°C to about 400°C to produce N-methyl succinimide which is purified and hydrogenated to form NMP.